CLAIMS

1. A microfabricated device for electrokinetically moving samples comprising:

a detection chamber for receiving a plurality of adjacent sample streams to be detected;

a plurality of adjacent input channels fluidly connected to said detection chamber, each of said plurality of input channels fluidly connected to said detection chamber via an enlarged end section; and

at least one output channel fluidly connected to said detection chamber.

2. The device of claim 1 wherein said end section varies in width as function of distance from the detection chamber, said end section being widest at said detection chamber.

3. The device of claim 2 wherein said end section has a gradual taper.

4. The device of claim 3 wherein said taper is linear.

5. The device of claim 3 wherein said taper is parabolic.

6. The device of claim 4 wherein adjacent input channels are separated by a tapered junction.

7. The device of claim 6 wherein said detection chamber further comprises a plurality of adjacent channel supports, said channel supports positioned opposite of said tapered junctions and useful in minimizing sample diffusion when electrical fields are applied to said device to electrokinetically move sample materials.

8. The device of claim 3 having only one y-shaped output channel positioned opposite of said plurality of input channels.

9. The device of claim 3 further comprising a number of output channels equal to said input channels and said output channels being positioned opposite of said input channels.

10. The device of claim 9 wherein said output channels are configured as mirror images of said input channels.

11. The device of claim 1 wherein said plurality of adjacent sample streams remain discrete for at least a threshold distance through the detection chamber, said threshold distance being between 10 to 2000 um.

12. A microfabricated manifold for use in electrokinetic applications comprising:
a detection chamber;
a plurality of adjacent channel inlets fluidly connected to said detection chamber; and
a plurality of tapered ends wherein adjacent channel inlets are separated by a tapered end.

13. The microfabricated manifold of claim 12 wherein each channel inlet comprises a first end section and a second wider end section downstream of said first end section.

14. The microfabricated manifold of claim 13 wherein each channel inlet is taper-shaped.

15. The microfabricated manifold of claim 14 wherein said taper is linear.

16. The microfabricated manifold of claim 14 wherein said taper is parabolic.

17. The microfabricated manifold of claim 12 further comprising at least one y-shaped outlet.

18. The microfabricated manifold of claim 12 further comprising a channel outlet positioned opposite each of said channel inlets.

19. The microfabricated manifold of claim 12 wherein said detection chamber further comprises a plurality of channel supports, said channel supports positioned opposite of said tapered ends such that a sample stream exiting said channel inlet flows between two channels supports and does not diffuse in the lateral direction.

20. A method for multiplexed detection of samples in a microfluidic device, said method comprising the steps of:

introducing a sample into at least two of said plurality of input channels of the device of any one of claims 1-11;

applying electrical fields to said device such that said samples flow as discrete sample streams from said plurality of input channels into said detection chamber; and

detecting a property of said sample streams while said sample streams flow through said detection chamber.

21. A method for multiplexed detection of samples in a microfluidic device, said method comprising the steps of:

electrokinetically flowing at least two sample streams into a detection chamber, said at least two sample streams defining a device plane;

directing a light beam through said detection chamber such that said light beam perpendicularly intersects said at least two sample streams and propagates in said device plane; and

detecting an optical property of said at least two sample streams as said streams flow through said detection chamber.

22. The method of claim 21 wherein said device further comprises tapered junctions extending into said detection chamber and useful in preventing said sample streams from laterally dispersing.

23. The method of claim 22 wherein said sample streams remain straight as said sample streams flow through said detection chamber.

24. The method of claim 21 further comprising electrokinetically flowing ancillary flows around said sample streams such that lateral dispersion is prevented.

25. The method of claim 21 wherein said light beam is a laser.

26. The method of claim 21 wherein said device further comprises a reflector for reflecting the light beam through the sample streams.

27. The method of claim 26 wherein the reflector is at a 45 degree angle.

28. The method of claim 26 wherein the light source is not normal to the plane of the device.

29. The method of claim 26 wherein the light beam is directed from a light source not in the plane of the device.

30. The method of claim 21 wherein the light beam is directed from a light source in the plane of the device.

31. A microfluidic system for carrying out various chemical and biochemical processes, said system comprising:

a microfabricated device having a detection chamber and a plurality of input channels, said input channels and detection chamber defining a plane of the device;

a controller adapted to provide electric fields such that when samples are present in said input channels, said samples can be electrokinetically manipulated through said input channels and into said detection chamber by application of said electric fields;

a light source adapted to direct a light beam across said detection chamber and in the plane of the device, said beam perpendicularly intersecting said samples when said samples flow through said detection chamber; and

at least one detector for measuring optical properties of said samples in said detection chamber wherein sample streams introduced into said detection chamber are detected simultaneously.

32. The system of claim 31 wherein said microfabricated device is a device as recited in any one of claims 1-11.

33. The system of claim 31 further comprising ancillary flow channels interposed between said input channels such that confining streams from said ancillary flow channels confine sample streams entering the detection chamber such that lateral diffusion is minimized.

34. The system of claim 31 wherein said input channels are separation channels and contain a medium useful in electrophoretic separations.

35. The system of claim 31 wherein at least one of said input channels is shaped as an input channel of FIG. 6.

36. The system of claim 31 wherein at least one of said input channels is shaped as an input channel of FIG. 7.

37. The method of claim 22 wherein said sample streams curve as said sample streams flow through said detection chamber.

38. The device of claim 6 wherein the tapered junction terminates at a point.

39. The device of claim 6 wherein the tapered junction has a blunt tip.

40. A microfabricated device for electrokinetically moving samples comprising a detection chamber as shown in FIG. 15.

41. The microfluidic system of claim 31 wherein said detection chamber includes a side wall having a draft angle less than 90 degrees.

42. The microfluidic system of claim 41 wherein said draft angle is 70 degrees.

43. The method of claim 21 wherein said detection chamber includes a side wall having a draft angle less than 90 degrees.

44. The method of claim 43 wherein said draft angle is 70 degrees.

45. The method of claim 43 further comprising the step of directing the beam at said side wall at an entry angle not equal to zero.

46. The method of claim 45 wherein the entry angle is between 1 and 5 degrees.

47. The method of claim 46 wherein the entry angle is between 2 and 3 degrees.